

## Role of Bariatric Surgery in Paediatric Obesity

Rajeev Gupta

Triple Accredited MBA (UK OUBS), AEQI, ACEI Consultant Paediatrician with special interest in Gastroenterology and Nutrition Chairman Central Specialist Committee Royal College of Paediatrics & Child Health Vice Chairman CESR Committee, Royal College of Paediatrics Ex-Chairman Regional Consultant Committee BMA Recent Chairman Regional Council British Medical Association Barnsley Foundation Hospital, United Kingdom

**\*Corresponding author:** Rajeev Gupta Triple Accredited MBA (UK OUBS), AEQI, ACEI Consultant Paediatrician with special interest in Gastroenterology and Nutrition Chairman Central Specialist Committee Royal College of Paediatrics & Child Health Vice Chairman CESR Committee, Royal College of Paediatrics Ex-Chairman Regional Consultant Committee BMA Recent Chairman Regional Council British Medical Association Barnsley Foundation Hospital, United Kingdom

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### Abstract

Childhood obesity has become an alarming global health issue. Among the various therapeutic strategies, surgery is progressively being recognized as a potent intervention for children and adolescents with severe and morbid obesity, typically those unresponsive to conventional treatments. This review investigates the role of surgery in the management of pediatric obesity, discussing the classification of obesity severity, the indications for surgery, and the different surgical procedures available. Each surgical technique's advantages and disadvantages are explored, alongside the rigorous preoperative investigations required. The review's objective is to provide a comprehensive understanding of the surgical approaches for pediatric obesity, further emphasizing the necessity for personalized treatment strategies for optimal outcomes.

### Introduction

Childhood obesity has become a burgeoning public health crisis over the past few decades, profoundly impacting the global healthcare landscape. The World Health Organization (WHO) states that obesity is one of the most serious public health challenges of the 21st century, which affects every region and socio-economic class [1]. In 2016, WHO reported that over 340 million children and adolescents aged 5-19 years were overweight or obese [2]. The Centers for Disease Control and Prevention (CDC) also reported that in the United States, the prevalence of obesity was 18.5% and affected approximately 13.7 million children and adolescents in 2017-2018 [3].

Childhood obesity leads to serious health consequences, including increased risks of type 2 diabetes, hypertension, dyslipidemia, non-alcoholic fatty liver disease, sleep apnea, and psychosocial problems [4]. Beyond immediate health implications, childhood obesity often persists into adulthood, raising the risk of developing cardiovascular diseases, some types of cancer, and osteoarthritis [5].

Given these consequences, there is a pressing need to tackle pediatric obesity effectively. The cornerstones of managing obesity in children and adolescents are lifestyle modifications, including dietary changes, increased physical activity, and behavior mod-

ification. However, in some instances, particularly in severe or morbid obesity, these interventions may not be enough. Consequently, medical professionals have begun to consider more aggressive therapeutic options, such as bariatric surgery, to mitigate this rising epidemic.

This paper aims to review the classification of pediatric obesity, the indications for considering surgical intervention, the necessary preoperative investigations, and the different types of surgeries available. This comprehensive review will also delve into the advantages and disadvantages of each surgical option, paving the way for more informed clinical decisions.

### Classification and Implications of Severe and Morbid Obesity in Children

Childhood obesity, specifically severe and morbid obesity, significantly impacts physical and psychological health, with considerable implications on the quality of life and health outcomes. Typically, obesity is classified based on the body mass index (BMI), calculated as weight (in kilograms) divided by height (in meters squared). However, given that children and adolescents are continually growing, and the distribution of body fat changes as they age, their BMI is evaluated relative to age- and sex-specific percentiles [6].

The American Heart Association classifies severe and morbid obesity as follows [7].

### Severe Obesity

Also known as class 2 obesity, severe obesity is defined in children and adolescents as a BMI that is 120% or more of the 95th percentile or a BMI of 35 or greater. Children with severe obesity are at risk for serious immediate health issues, including type 2 diabetes, high blood pressure, and sleep apnea, as well as long-term health problems like heart disease, cancer, and arthritis [8].

### Morbid Obesity

In pediatrics, morbid obesity, or class 3 obesity, is defined as a BMI that is 140% or greater of the 95th percentile or a BMI of 40 or greater. This level of obesity indicates a disease state that significantly increases the risk of obesity-related comorbidities or a reduction in life expectancy. Morbid obesity in children not only leads to severe physical health complications, such as heart disease, type 2 diabetes, and orthopedic problems, but it is also linked with significant psychosocial and quality of life impairments [9].

There's also the concept of super obesity, referred to in some literature as class 4 obesity, which is generally defined in adults as a BMI of 50 or more [10]. However, the definition and clinical utility of this category in children are still under investigation.

The rising prevalence of severe and morbid obesity in children and adolescents underscores the urgent need for robust intervention strategies. As traditional lifestyle modifications might not be enough for these categories, more aggressive treatment modalities such as pharmacotherapy and bariatric surgery are being increasingly considered in the comprehensive management of these conditions.

### Indications for Bariatric Surgery in Pediatric Obesity

Bariatric surgery in pediatric patients is generally considered a last resort after all non-invasive treatments, such as lifestyle modifications and pharmacotherapy, have failed to achieve or maintain adequate weight loss. As a rule, surgical intervention for obesity should be considered only when the child's degree of obesity has resulted in severe medical complications and impaired quality of life.

The guidelines provided by the American Society for Metabolic and Bariatric Surgery (ASMBS), the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), and the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) outline the primary indications for bariatric surgery in pediatric patients [11-13].

### Age and Maturity

The patient should have attained, or nearly attained, physiological maturity, typically around the age of 13 for girls and 15 for boys, which usually corresponds to Tanner Stage 4 or 5 of sexual maturation. This consideration is crucial as the long-term effects of altering the gastrointestinal anatomy before full maturity are not well known.

### BMI Criteria

Patients with a BMI >40 kg/m<sup>2</sup>, or >35 kg/m<sup>2</sup> with significant, severe comorbidities such as type 2 diabetes, moderate-to-severe sleep apnea, pseudotumor cerebri, or severe nonalcoholic steatohepatitis, are considered eligible for surgery.

### Failed Attempts at Weight Loss

Bariatric surgery should only be considered if there is a documented history of failed attempts at medical weight loss therapy, including nutritional, behavioral, and pharmacological interventions.

### Understanding and Commitment

The patient should understand the lifelong commitment that comes with the surgery, including the need for adherence to dietary guidelines, the importance of physical activity, and regular medical follow-up. The family's commitment is also vital, as the long-term success of the surgery depends significantly on familial support.

### Psychological Evaluation

A comprehensive preoperative psychological evaluation is recommended to assess the patient's emotional maturity, mental status, and understanding of the implications and lifelong changes associated with surgery.

It's worth noting that bariatric surgery is not recommended in patients with untreated psychiatric illness, ongoing substance abuse issues, or inability to comply with nutritional supplementation [14].

### Types of Bariatric Surgery

There are several types of bariatric surgery, each with its own unique advantages and disadvantages. These procedures can be broadly categorized into restrictive procedures, malabsorptive procedures, and procedures that combine both elements. Here we discuss the most common types and the considerations associated with each.

### Laparoscopic Adjustable Gastric Banding (LAGB)

LAGB is a purely restrictive procedure that involves placing an inflatable band around the upper part of the stomach to create a small pouch. This slows down food consumption and promotes a feeling of fullness after eating small amounts of food [15]. However, this procedure has been falling out of favor due to relatively poor long-term weight loss outcomes and high reoperation rates for band slippage, pouch dilatation, or device malfunction [16].

### Sleeve Gastrectomy (SG)

In this restrictive procedure, approximately 80% of the stomach is removed, leaving a narrow gastric "tube" or "sleeve." The smaller stomach size limits the amount of food intake, and the resection of the part of the stomach that produces ghrelin—the "hunger hormone"—may decrease appetite [17]. SG has gained popularity due to its technical simplicity, effectiveness, and favorable safety profile. However, it is not reversible, and there are potential risks of leakage, strictures, and nutritional deficiencies [18].

## Roux-en-Y Gastric Bypass (RYGB)

RYGB is a combined restrictive and malabsorptive procedure. It involves creating a small pouch at the top of the stomach and attaching it directly to the middle portion of the small intestine (the jejunum), bypassing the rest of the stomach and the upper part of the small intestine (the duodenum). RYGB often leads to more significant weight loss than purely restrictive procedures and improves obesity-related comorbidities such as diabetes. However, it carries potential risks, including anastomotic leakage, strictures, ulcers, and nutrient deficiencies [19].

## Biliopancreatic Diversion with Duodenal Switch (BPD/DS)

BPD/DS is a less common procedure that combines a sleeve gastrectomy with a significant bypass of the small intestine. It leads to substantial and durable weight loss and can profoundly improve type 2 diabetes. However, it carries a higher surgical risk and results in significant malabsorption, leading to serious nutritional deficiencies. Hence, it is reserved for patients with extreme obesity (BMI>50) or severe comorbidities [20].

As more research is conducted on the safety and efficacy of these procedures in the pediatric population, clinicians can make better-informed decisions about which surgery is the best fit for each patient, considering the severity of obesity, comorbid conditions, and patient preferences.

## Conclusion

The burden of severe and morbid obesity in children and adolescents necessitates decisive therapeutic interventions. Surgical options, while representing the last resort in management, have demonstrated promising results in both weight reduction and amelioration of comorbidities. Although types of surgeries, including LAGB, SG, RYGB, and BPD/DS, offer unique advantages, they also carry specific risks and long-term implications, emphasizing the importance of personalized, patient-centered decision-making in this population. Furthermore, indications for surgery must be meticulously evaluated to ensure maximal benefits. Preoperative investigations are critical in reducing postoperative complications, and a lifelong commitment to altered dietary habits and regular follow-ups is mandatory for durable success. Further high-quality research is warranted to refine the selection criteria and follow-up protocols, to enhance surgical outcomes, and to assess the long-term safety and effectiveness of these interventions in the pediatric population.

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